

PHYSICAL AND OPTICAL MEASUREMENTS

Laser system for dimensional measurements

Model 5526A



Model 5526A Laser/Display System Base



10565B 10550B
Option 10 Linear Measurement Interferometer

Choice of options for Length, Angle, Flatness, Straightness Non-contact and 2 Axes

Configuration

The 5526A Laser Measurement System is a major advance in economical dimensional metrology. A choice of options allows the measurement of length, angle, flatness, straightness, squareness, and parallelism. In addition, output options are available to reduce the data to printed or plotted format. The 5526A, which forms the base of the system includes the 5500C Laser Head and the 5505A Laser Display. Measuring and output options are added to this base system to allow modular build-up of measurement capability.

General capabilities

The system is a highly accurate displacement measuring tool with a resolution of one millionth of an inch (0.01 μm) for linear measurements and 0.1 arc-second for angular measurements. Fully automatic tuning, instant warm-up and remote interferometric measurement techniques assure drift-free accuracy from the moment of switch-on. A laser tube lifetime in excess of 10,000 hours can be confidently expected and the unique optical heterodyning principle makes for practical, convenient measurements in adverse environments.

Measurement options

Option 010 linear interferometer

This option consists of the 10565B Remote Interferometer and a 10550B Retroreflector. Since the Remote Interferometer is completely passive, it makes for an almost perfect linear measuring instrument. Complete thermal stability is assured since the laser head can be some distance away on a tripod.

Option 020 linear + angular/flatness interferometer

While including all the capabilities of the Option 010 Linear Interferometer, this option also provides angular measurement ability. The addition of passive optical modules allows fast, accurate measurements of pitch, yaw, or flatness. The option also includes two turning mirrors designed especially for rapid calibration of surface plates.

Option 030 straightness interferometer

This option converts the 5526A into an interferometric straight-edge. Lateral deviations from a perfectly straight line are displayed to a resolution of one millionth of an inch (0.01 μm) over an axial range of 10 feet (3 m). Unlike alignment lasers, the Hewlett-Packard system does not depend on the pointing stability of the laser beam for its reference, but instead uses two rigidly mounted plane mirrors and a special prism interferometer. A long range version (Option 31) is also available with a resolution of ten millionths of an inch (0.1 μm) over an axial range of 100 feet (30 m).

Ideal for determining geometric characteristics of machine tools, the Straightness Option can also measure such parameters as parallelism and with an optional optical square, squareness.

Option 200 series laser measurement/calculator systems

The combination of the 5526A Laser Measurement System with the Model 9820 or 9821 Calculators provides a complete problem solving system for a wide variety of measurements.

A package of metrology applications programs enables fast data reduction and plotting of measurements such as surface plate calibration, lead error analysis and geometry characteristics of machine tools and measuring machines, including straightness, parallelism and squareness. One important program included implements the NMTBA (National Machine Tool Builders Association) recommendations for accuracy and repeatability of numerically controlled machine tools.

5510A Automatic compensator

The 5510A Automatic Compensator provides accurate, continuous correction for variations in the refractive index of air and for temperature of the material being measured. Air temperature, pressure, humidity and material temperature are measured by rugged sensors designed especially for use in machine shops.

Additional options

Other options to the 5526A Laser Measurement System are available including a Single Beam Interferometer which in conjunction with the non-Contact Converter measures displacement of reflective surfaces. The Plane Mirror Converter when added to the Remote Interferometer of Option 010 allows measurements from a plane mirror surface with relative insensitivity to mirror tilt.

Brief specification

5526A Laser/display

Laser: Helium-Neon type. Fully automatic tuning. Instant warmup. Accuracy (for all linear displacement measurements): ± 0.5 parts per million ± 1 count (Metric ± 0.5 parts per million ± 2 counts).

Resolution: normal and smooth modes

Normal 0.000,01 in. Metric: 0.1 μm . Angular: 1 arc-sec **X10** 0.000,001 in. Metric 0.01 μm . Angular: 0.1 arc-sec.

Maximum allowable signal loss: 95% (-13 dB).

Maximum measuring velocity: 720 in/min (182 m/min).

Atmospheric and material compensation: manual input from tables.

5510A Automatic compensator optional.

Option 10 linear interferometer

Accuracy: as for 5526A Laser Display

Maximum measuring range: up to 200 feet (60 m) depending on conditions.

Option 20 linear + angular/flatness interferometer

Linear specifications are as for Option 10.

Accuracy: ± 0.1 arc-second (± 1 count in last digit) up to ± 100 arc-seconds. ± 1 arc-seconds (± 1 count in last digit) up to ± 1000 arc-seconds. ± 4 arc-seconds per degree (± 1 count in last digit) up to ± 10 degrees using correction table.

Option 30 short range straightness interferometer

Accuracy

Inch: ± 5 microinches/foot ± 1 count in last digit.

Metric: ± 0.4 micrometer/meter ± 2 counts in last digit.

Calibration: $\pm 3\%$ of reading.

Resolution: as for 5526A Laser/Display

Lateral range: ± 0.1 inch (± 2.5 mm).

Axial range: 10 feet (3 m)

Option 31 long range straightness interferometer

Accuracy: as for Option 030.

Calibration: $\pm 10\%$ of reading.

Resolution

Normal: 0.0001 inch (1 μm).

X10: 0.00001 inch (0.1 μm).

5510A automatic compensator

5526A/5510A System accuracy (worst case):

- For air temperature within range 68–85°F (20–30°C) 1.3 ppm ± 1 count (metric 1.3 ppm ± 2 counts).
- For air temperature within range 55–105°F (13–40°C) 1.5 ppm ± 1 count (metric 1.3 ppm ± 2 counts).

Options

Options	Price
010 Linear Interferometer	\$3895
020 Linear + Angular/Flatness Interferometer	\$5985
030 Straightness Interferometer	\$3895
200 Laser Measurement/Calculator System	\$33,845
908 Rack Flange Kit	add \$10

Model number and name

5510A Automatic Compensator	\$4500
5526A Laser/Display	\$10,750